

REMARKS

Upon entry of the amendments, claims 1, 3-15, 17-27, and 30-33 will be pending in the above-identified application. Claims 2 and 29 have been canceled without prejudice to Applicants' right to prosecute these claims in a related, co-pending application. Claims 1 and 24 have been amended, and new claims 30-33 have been added. Applicants submit that the amendments and new claims are supported in the specification as originally filed, and therefore, no new matter has been added by these amendments and new claims.

Rejections Under 35 U.S.C. §103

Claims 1-3, 9-15, 17-23, and 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over Chishti in view of Watt.

While Applicants respectfully disagree with the rejection and do not acquiesce to any reasoning provided by the Examiner, claim 1 has been amended in order to clarify certain differences between the present invention and the cited references, and to further advance prosecution of the present case. Claims 30-33 have been newly added. As recited in claim 1, the present invention is directed to a computer-implemented method for generating a computer model of one or more teeth, the method including receiving as input a digital data set of meshes representing the teeth; creating inside and outside meshes by determining an intersection between a tooth mesh and a cutter mesh; creating a parametric representation of the teeth from the meshes representing the teeth and the inside and outside meshes, the parametric representation comprising exposed tooth surface image data and unexposed tooth portion image data, and further providing compression of the digital data set; and displaying the parametric representation of the teeth providing the compressed digital data set so as to provide a high-resolution image of the teeth. The method as recited in current claim 1, including creating a parametric representation according to the present invention is described throughout the originally filed specification. See, e.g., 0043-0053 of the published application; FIG. 4; FIG. 5, FIG. 6.

As can be understood with reference to the Figures and the originally filed specification for this case, the method of claim 1 provides numerous advantages in computer modeling of a patient's teeth according to the currently disclosed invention. See generally, e.g., paragraphs 0012-0014 of the published application. First, creating a parametric representation of the teeth as recited in claim 1 provides improved imaging/computer modeling and image data of features of a patient's teeth, including improved imaging/modeling of unexposed surfaces or portions of the teeth (e.g., interproximal areas, tooth root, root shapes, etc.) not necessarily visible from the original input mesh data set. See, e.g., paragraph 0067 of the published application; see also, paragraphs 0045-0054 of the published application.

Second, in addition to providing improved graphical representation of the teeth, creation of the parametric representation as described actually significantly reduces image file size, thereby effectively providing a sort of compressing of the digital data set. The enhanced information image data with a reduced file size provides numerous advantages compared to large volume data sets that are inefficient and cumbersome, particularly with respect to data storage, transmission, etc. See, e.g., paragraphs 0012, 0045 of the published application.

Third, while digital data set size is significantly reduced, the described and claimed methods provide this and other advantages without sacrificing image resolution. Moreover, generation of realistic high-resolution models of a patient's teeth can be accomplished without requiring a user to perform complex data conversion steps that require in-depth knowledge of parameters associated with patient image rendering or dental data compression. See, e.g., paragraphs 0013, 0063, Figure 7, of the published application. Thus, the claimed methods at least provides advantages of enhanced image data/information, reduced file size, and allow fast, efficient storage and transmission, and rendering of high-resolution images. Other additional advantages will be apparent from the disclosure as originally filed. Not only do the cited reference fail to provide the significant advantages of the methods of the invention, but the cited references, taken alone or in combination, also fail to teach each and every element of the computer-implemented method of claim 1, thereby precluding *prima facie* obviousness.

Chishti teaches a system for repositioning teeth comprising a plurality of individual appliances, wherein the teachings of Chishti include computer remodeling, including

producing digital data sets representing tooth arrangements. While Chishti represents a considerable advancement in the art, Chishti fails to teach numerous aspects of the claimed invention. For example, Chishti teaches generating an image of a patient's teeth and "[i]n order to reduce the computer time necessary to generate images, a parallel set of digital data set representing the IDDS at a lower resolution will be created." (see, col. 10, lines 51-53 of Chishti). Chishti, however, at least fails to teach creating a parametric representation of the teeth from meshes, or creating such a representation that includes the image data (e.g., exposed tooth surface and unexposed tooth portion image data) as recited in claim 1. Chishti further fails to teach any means of representing teeth so as to provide both compressing data and provide a high-resolution image of the teeth. In fact, Chishti teaches just the opposite in teaching removal of data to generate a lower resolution for improving manageability of data transmission. As such, Chishti not only fails to teach or suggest numerous elements of the current claims, and actually teaches away from providing a high-resolution image as currently described, but also fails to provide numerous advantages provided by the currently claimed invention.

The newly cited reference to Watt is now being cited by the Examiner in order to cure the numerous deficiencies of Chishti as noted above, but fails to provide the missing teachings at least for the numerous reasons set forth below. First, Watt simply fails to provide the elements of claim 1 that are missing from Chishti. Watt merely provides generic teachings regarding surface fitting/rendering techniques, in general, but Watt is silent about application of these generically described techniques in dental/orthodontics or in creating a representation of a patient's teeth. Watt lacks the specific teachings as described in the current specification, e.g., at paragraphs 0045-0062 of the published application, for practicing the claimed method as recited in claim 1. Producing the claimed invention is not merely an exercise of simple mechanics in combining the two cited references, but even if combined would actually require additional teachings and/or reconstruction or re-engineering not taught by either reference alone or in combination. Indeed, the cited Watt reference laments the difficulties in fitting parametric surfaces, in general (see, e.g., opening paragraph of the reference including stating *inter alia* that "Fitting a parametric surface through an arbitrary set of data points is a difficult problem.")

Thus, even if, for arguments sake only, one of ordinary skill were to attempt to combine the techniques of Watt with the system of Chishti (even though the Examiner has failed to provide any adequate rationale for doing so - see below), without the benefit of the teachings of Applicants own specification, the combination of cited references would still lack the specific teachings necessary to produce the currently claimed invention. Watt fails to teach creating a parametric representation of teeth from meshes, as recited in claim 1, and certainly fails to teach a parametric representation comprising exposed tooth surface image data and unexposed tooth portion image data, and further providing compression of the digital data set of meshes, as recited in claim 1.

Second, Applicants respectfully submit that the Examiner's provided rationale for combining the cited references is inadequate and misplaced. In particular, it is alleged that "[t]he motivation for combining the references would have been to reduce the size of a set of data, such as a file or a communications message, so that it can be stored in less space or transmitted with less bandwidth." However, a review of the reference to Watt was unable to locate any discussion of data compression techniques per se or use of the surface fitting techniques specifically to reduce file size. Similarly, the cited dictionary definition of data compression makes no reference to Watt or parametric surface fitting. Furthermore, Chishti already teaches a method of reducing the size of a set of data (i.e., creating lower resolution images), so what would be the motivation for introducing another means of data reduction where Chishti already provides a solution? Moreover, Chishti makes no reference or mention of the Watt reference, which pre-dates Chishti by some 5 years, further weighing against the alleged obviousness and motivation to make the proposed combination. Applicants further respectfully disagree with the Examiner's characterization of Applicants previously stated position or the Examiner's interpretation of paragraph 0045 of the specification.

Thus, as the teachings of Watt are limited to a non-specific discussion of general surface fitting techniques and lack specific teachings with respect to a method including creating a parametric representation of the teeth from meshes, as set forth in the current claims, no reasonable combination of Chishti (which is devoid of teachings regarding creating a parametric

representation as claimed) and Watt would teach or suggest each and every element of the currently claimed methods, thereby precluding *prima facie* obviousness.

Accordingly, for the reasons set forth above, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and request that the rejections of claims 1-3, 9-15, 17-23, and 29 under 35 U.S.C. §103(a) be withdrawn.

Claims 4-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Chishti in view of Watt and further in view of Official Notice.

The combination of Chishti and Watt as applied to claim 1 is overcome at least for the reasons set forth above. In particular, neither Chishti nor Watt, alone or in combination, would teach or suggest a method including creating a parametric representation of the teeth from the meshes representing the teeth and the inside outside meshes, the parametric representation comprising exposed tooth surface image data and unexposed tooth portion image data, and further providing compression of the digital data set, as recited in claim 1. The Official Notice fails to provide the teachings that are missing from Chishti and Watt.

Regarding current claim 5, Applicants respectfully submit that this claim is further distinguished from the proposed combination of references because, as noted above, Chishti teaches transmitting and displaying an image with a lower resolution compared to the digital data set. Chishti, alone or in combination with the other cited references, would not reasonably teach displaying a high resolution image from the compressed data on the remote computer, as recited in claim 5.

Accordingly, Applicants respectfully request that the rejections of claims 4-8 under 35 U.S.C. §103(a) be withdrawn.

Claims 24-26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Chishti in view of Watt, and further in view of Yamani.

The combination of Chishti and Watt as applied in rejection of claim 24 is overcome at least for a similar rationale as discussed above, for example, with regard to claim 1. Neither Chishti nor Watt, alone or in combination, would teach or suggest a method including

each and every element, including at least creating a parametric representation of the teeth from the meshes as recited in claim 24. Yamani is cited as teaching receiving an input from a 3D gyroscopic input device, but Yamani fails to provide the data compression teachings that are missing from Chishti and Watt. Thus the cited references, taken either alone or in combination, would fail to teach or suggest each and every element of the invention as recited in claim 24. Claims 25 and 26 will be allowable at least for depending from allowable independent claim 24.

Accordingly, withdrawal of the rejections of claims 24-26 under 35 U.S.C. §103(a) is respectfully requested.

Claim 27 is rejected under 35 U.S.C. §103(a) as being unpatentable over Chishti in view of Watt, and further in view of Yamani, and further in view of Official Notice.

The combination of Chishti, Watt, and Yamani as applied to claim 24 is overcome for at least the reasons set forth above. The proposed combination of references would fail to teach or suggest each and every element of claim 24. Claim 27 will be allowable at least for depending from allowable independent claim 24.

Accordingly, withdrawal of the rejections of claim 27 under 35 U.S.C. §103(a) is respectfully requested.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 206-467-9600.

Respectfully submitted,

Dated: _____

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Michael T. Rosato
Reg. No. 52,182

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 206-467-9600
Fax: 415-576-0300
MTR:jae
61042048 v1